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Gave to Andy 9/8/2000 for comment

September 6, 2000

Mrs. Gwen Zervas
Case Manager
New Jersey Department of Environmental Protection (NJDEP)
Bureau of Federal Case Management
Division of Responsible Site Party Remediation
CN 028
Trenton, NJ 08625-0028

Subject: L.E. Carpenter & Company (LEC), Wharton, New Jersey
Work Plan for Delineating and Characterizing Elevated Lead Concentrations in Soil

Dear Mrs. Zervas:

RMT, Inc. (RMT) has prepared this Work Plan on behalf of LEC to delineate and characterize elevated lead concentrations in soil at the LEC property located at 170 North Main Street in Wharton, New Jersey. LEC agreed to submit this work plan during a telephone conference that took place on July 31, 2000. This work plan addresses concerns outlined in the NJDEP letters dated April 13, 2000, and August 1, 2000, and those discussed during the July 31 teleconference. Specifically, the goals of this work plan are as follows:

- **Determine possible sources for the elevated lead.**
- **Finish the horizontal and vertical delineation of elevated lead concentrations in soil.**
- **Assess the risk associated with lead in soil.**
- **Evaluate alternative remedial options.**

TASK 1: LEAD SOURCE EVALUATION

In the August 1, 2000 letter from NJDEP, EPA provided the following comments:

- "As EPA has previously stated, attempts to tie on-site lead to historical mining must be adequately supported".
- "While L.E. Carpenter has previously stated that historical mining activities (or mining spoils) were located at the site, no concrete supporting data has ever been submitted."
- "Merely stating that mining took place in the general vicinity is not sufficient evidence upon which to alter the Record of Decision (ROD) remedy."

Weston previously submitted references and documentation showing that mining occurred directly on the LEC property in their September 1992 report "Final Supplemental Remedial Investigation

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Addendum for L.E. Carpenter and Company". In addition, Sanborn fire insurance maps were also included in the 1992 report that showed some of the extensive history and uses of the various manufacturing buildings. For your convenience, RMT has synthesized relevant information from that report and other references into this work plan (e.g., Figure 1). The information previously provided is clear-cut evidence that the LEC site has had a long history of usage, including mining and other types of manufacturing. Nevertheless, the source for the elevated lead detected in soil at the LEC property is still unclear. Understanding the source of the lead detected in site soil is important from the standpoint of determining risk and for identifying liability. RMT will use both historical and analytical methods in our attempt to identify the source(s) for the elevated lead concentrations.

Historically, we know that the property has had industrial and mining operations on it since at least the late 1700s. Early development of Morris County was a direct result of the presence of iron ore deposits exposed at the surface throughout the County. The Dover district was providing iron ore as long ago as 1710, when both the Mt. Hope mine (three miles northeast of the LEC property) and Dickerson mine (three miles southwest of the LEC property) were in operation (Sims, 1958). A smelting furnace for converting iron ore into bar iron was built at Dover in 1722 (the John Jackson forge). The Washington forge was built in about 1795 (W.W. Munsell & Co., 1882). The Washington forge was located on the current LEC property (NJDOL, 1989). Because construction of the Washington forge pre-dates development of the on-site mines (described below), iron ores from other nearby deposits would have been transported to the site for use in the forge (especially the Dickerson and Mt. Hope mines).

According to a New Jersey Department of Labor publication (NJDOL, 1989), the Washington Forge Mine and West Mount Pleasant Mine are located "in the L.E. Carpenter lot". The NJDOL report states that the Washington Forge Mine opened in 1868 with the construction of two inclined shafts 20 feet apart on the grounds of the old forge. The mine was actively worked until 1875 when it was closed because of the difficulty in handling groundwater seepage into the mine (Bayley, 1910). The mine reportedly opened again in 1879 after a drainage tunnel to the Orchard mine was completed. The Orchard mine was located across the Rockaway River from the LEC site (Figure 1). The Washington Forge mine was permanently abandoned in 1881. The West Mt. Pleasant Mine connects with the Washington Forge Mine with an inclined access shaft located about 170 feet northeast of the southern-most Washington Forge mine shaft (Figure 1). Neither the Bayley or Sims reports indicate when the West Mount Pleasant mine was closed. The known iron ore production for the Wharton area is reported to be about 2,250,000 tons (NJDOL, 1989). Sims (1958) estimates a total production of 50,000 tons from the Washington Forge Mine; the total production from the West Mount Pleasant mine is unknown.

RMT superimposed the location of the mines on the site map (Figure 1) based on a United States Geological Survey map contained in the "Geology and Magnetite Deposits of Dover District, Morris County, New Jersey" (Sims, 1958). Maps showing the inclined shaft entrance locations are provided in all three references (Bayley, Sims, and NJDOL). Although the mineshaft locations are slightly different in each publication, all agree that the mine entrances were located between North Main Street and the railroad tracks. The iron forge and mining history described above clearly shows that:

- **Iron ore deposits exist in the subsurface in both the bedrock and unconsolidated glacial deposits directly below the LEC property.**
- **Iron smelting operations occurred directly on the LEC property beginning in the late 1700's.**
- **Iron ores from various Morris County locations other than the on-site mines were transported onto the LEC property for processing.**
- **Iron mining and smelting operations occurred on-site over a period of at least 86 years (1795–1881).**

LEC owned and operated the facility from 1943 through 1987. LEC designed and manufactured vinyl wall coverings. Potential sources of lead from the LEC operation are currently unknown. Silk and hosiery manufacturing operations took place on the LEC property before LEC began operations. RMT will include our analysis of available Sanborn maps in the final lead-investigation report. We have incorporated select information from some of these maps on Figure 1. LEC Building 14, which centers on the area with the highest soil lead concentrations, was built between 1916 and 1927, and originally operated as a hosiery manufacturing company.

The history noted here points to several possible sources for the lead, some of which may indicate natural occurring minerals as the source. A sample of ore from the Washington Forge mine was tested and the results presented in Bayley (1910) show that 0.245%sulfur was present in the ore sample. Naturally occurring lead is often associated with sulfide mineralization, and thus could be associated with on-site ore deposits and/or tailings. We will evaluate details of this history as part of this work plan and use it to identify other possible sources for the lead.

RMT will also use direct observational and analytical evidence to identify possible sources for lead. We will use laboratory analytical data from samples collected during Task 1 to identify the spatial distribution of lead and physical characteristics of soils containing lead, and will evaluate the data in light of historical uses on the site. One of the possible sources for lead in site soils is from mine tailings and ore associated with on-site deposits and nearby mines including the Washington Forge and West Mount Pleasant mines. Mineralogical evaluation including field evaluation (identification of observable rocks and minerals using binocular microscope) and thin section analysis (if appropriate based on field observations) will be used to determine the minerals present. If RMT identifies naturally occurring minerals containing lead, we will estimate the approximate percent contribution of these minerals to the elevated lead in the site soil samples.

TASK 2: DELINEATE VERTICAL AND HORIZONTAL EXTENT OF ELEVATED LEAD CONCENTRATIONS

LEC has investigated soil and groundwater conditions at the site since 1986. RMT and Weston collected and tested about 120 soil samples from over 100 locations and at various depths. These data show that soil lead concentrations above the target cleanup level (600 mg/kg) exist at several locations on the LEC property. The data also shows that elevated levels of lead are ubiquitous across the site. The average abundance of lead in the earth's crust is about 12 ppm (Krauskopf, 1967). This value is similar to the average lead found in soils included in a background soil survey of New Jersey (NJDEP, 1993), which ranges from 14 to 22 ppm (includes farm, golf, rural, and suburban settings). In contrast, soil lead concentrations at the LEC site are commonly more than 100 ppm (Figure 2). Such a widespread distribution would more appropriately match a source related to the geological and mining history of the site rather than point sources and surficial discharges related to LEC manufacturing operations. In addition, there are no known sources of lead that have been identified to date related to the LEC manufacturing process.

Weston reportedly excavated lead-impacted soils from the Former Waste Disposal area and removed them from the site. Soils that Weston excavated from Hot Spots A, B, C, and D were reportedly stockpiled around the former Building 14 footprint (see area labeled as "4-foot soil pile" on Figure 2). The area containing the most samples showing lead in excess of the 600 mg/kg cleanup level is near and around former LEC Building 14, mostly within and immediately adjacent to the stockpiled soil (Figure 2). The vertical and horizontal extent of lead concentrations above 600 mg/kg is currently undefined at some locations. Completion of the site investigation described below will fill-in the delineation data-gaps and provide data necessary to perform an evaluation of the risk associated with dermal contact, inhalation, and groundwater migration pathways.

RMT will implement an aggressive, real-time approach to sampling to accomplish the investigation goals in one mobilization. Specifically, this investigation will involve the following tasks:

1. **Surface Soil Sampling**: RMT will collect surface and near-surface soil samples (approximately grade to 1 feet below ground surface ~ bgs) at the initial locations shown on Figure 2. We will collect soil using a clean stainless steel hand trowel, place the sample into a plastic bag, and measure each using a field-portable X-ray Fluorescence Analyzer (XRF). When required, coarser-grained samples will be crushed via mortar and pestle before analysis with the XRF. The XRF instrument is capable of measuring lead concentrations down to approximately 10 ppm. We will obtain and record at least four readings for each sample and calculate an average concentration. Averaging several readings minimizes the error associated with small-scale variability.

   RMT will interpret data from the initial sampling locations and choose subsequent sampling locations based on the initial results. This interactive approach will increase the probability that we can define the extent of lead-impacted surficial soil within one mobilization.

2. **Subsurface Soil Sampling**: Following the initial surficial soil survey, RMT will determine final locations for test trenches. These test trenches will allow us to estimate vertical extent of soil elevated in lead. We will collect subsurface soil samples using a backhoe and analyze them using the XRF. In areas where previous data shows lead concentrations more than 600 mg/kg, we will collect samples from depths below the deepest adjacent occurrence of lead. We will again use field data from the initial test-pit samples to choose subsequent sample locations and depths, if necessary. Most of the test pit excavations will have a depth of about 5 -10 feet below grade. We will place excess soils back into the boring or trench once sampling, photographic, and stratigraphic evaluation is complete. Test pits placed within the area of stockpiled soils will be back-filled in two stages such that only native soils from below the stockpiled soils will be placed back in the trench first, followed by excavated stockpiled soils.

   RMT will submit twenty five percent of the samples analyzed using the XRF to an analytical laboratory for total lead analysis. We will also test selected samples with elevated levels of lead for total organic carbon (TOC) to assist in the risk assessment, and will use results from the laboratory analysis to verify the XRF data. Results from the XRF and laboratory analyses will assist us in determining the extent of soils with elevated total lead and provide data for the risk analysis described later in this Work Plan.

   RMT will submit two composite samples of soils with elevated lead (based on field XRF data) to the laboratory for SPLP lead testing. We will collect one composite sample from the area of stockpiled soils, and one composite sample from areas outside the stockpiled soil. SPLP data will supplement the groundwater data to evaluate the potential for lead to mobilize via rainfall infiltration into shallow groundwater.

3. **Background Soil Sampling**: RMT will collect surficial and subsurface soil samples from the five background areas located on Figure 1. We will submit the samples to a laboratory for total lead analyses, and use the results to evaluate the source of lead present in soil as described in Task 2. We will collect vertical profile samples and field-test them with the XRF. We will choose these vertical profile samples at intervals of at least one per every two vertical feet of test pit. We will also choose samples based on our visual observations. Most of the test pit excavations will have a depth of about 5 -10 feet below grade. We will place excess soils back into the boring or trench.

4. **Groundwater Sampling**: RMT will obtain groundwater samples from twenty-one (21) monitoring wells (Figure 1). We will use low-flow sampling protocols, collect one filtered and one unfiltered sample from each well, and analyze each sample for total lead and dissolved lead respectively. We anticipate collecting these samples during the quarterly sampling event and all procedures used will be consistent with the procedures used to collect the quarterly samples.

TASK 3: RISK ASSESSMENT

RMT will conduct a focused risk assessment (RA) to evaluate the potential risk to human health from direct contact and inhalation of lead at the site. The RA will conform to the guidance presented in the EPA document "Recommendations of the Technical Review Workgroup for an Interim Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil" (USEPA, December 1996). RMT will evaluate the risk for an adult worker using site-specific parameters and total lead concentrations. We will incorporate the results of this RA into the analysis of remedial alternatives described in Task 4.

TASK 4: ANALYSIS OF ALTERNATIVE REMEDIAL ACTIONS

RMT will evaluate remedial alternatives other than excavation and off-site disposal of lead-impacted soils if data collected as part of this work plan indicates that other remedial options are potentially viable. We will use existing data, data collected during the site investigation, the results of the risk analysis, and historical information to develop options for leaving soils on site. These options will include no action and capping with a clean soil or asphalt cover.

REFERENCES

A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey, New Jersey Department of Environmental Protection & Energy Site Remediation Program and Division of Science and Research, September, 1993.

Abandoned Iron Mines of Minehill, Randolph Twp., & Wharton Boro, Morris County, New Jersey, 1989, State of New Jersey Department of Labor, Division of Workplace Standards, Office of Safety Compliance, Trenton, New Jersey.

Geology and Magnetite Deposits of Dover District, Morris County, New Jersey, 1958, Paul K. Sims, Geological Survey Professional Paper 287.

Iron Mines and Mining in New Jersey, William S. Bayley, 1910, Geological Survey of New Jersey, MacCrellish & Quigley State Printers.

History of Morris County, New Jersey, 1739-1882, with Illustrations and Biographical Sketches of Prominent Citizens and Pioneers; New York, W.W. Munsell & Co., 1882; pages 39-48 from www.rootsweb.com/~njmorris/history.htm

LEC requests that the USEPA and NJDEP review and approve this Work Plan to evaluate on-site lead-impacted soils. RMT will take steps to implement this work plan immediately upon approval. We anticipate submitting the results of this work plan to EPA and NJDEP within 90-days from the date of approval.

Sincerely,
RMT, Inc.

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